

Untreated Syphilis in the Male Negro

III. Evidence of Cardiovascular Abnormalities and Other Forms of Morbidity

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Two previous papers (1, 2) in this series have described the source of the material and the objectives of the investigation. Briefly, the study is a continuing attempt to follow the natural history of syphilis, uninfluenced by treatment, in adult male Negroes, with special attention to its effect on the cardiovascular system.

The individuals comprising the group being studied were first examined in 1932 and 1933. A report dealing with the physical and laboratory findings of these examinations was published in 1936 (1). It was found that among 399 untreated syphilitics and 201 presumably uninfected controls, the proportion presenting some evidence of morbid processes of any etiology was considerably higher in the former group, 84 percent, as compared with 39 percent in the latter. Abnormal findings were most frequently associated with the cardiovascular system.

In 1938 and 1939, a second physical examination was made of as many of the original group as could be reached. As might have been expected, it was found that a considerable proportion of the syphilitics had received small amounts of treatment (usually only one or two injections), although 12 individuals had received as many as 10 injections.

A cooperative study project assisted by annual grants from the Milbank Memorial Fund. Initiated under the direction of Taliaferro Clark, M. D. Clinical examinations by O. C. Wenger, M. D.; R. A. Vonderlehr, M. D.; J. R. Heller, Jr., M. D.; and A. V. Deibert, M. D. Follow-up directed by M. Smith, M. D. Postmortem examination by J. J. Peters, M. D. Pathologic examinations by R. D. Lillie, M. D. Statistical analysis by L. J. Usilton, M. A.; P. T. Bruyere, M. D., M. P. H.; and M. C. Bruyere.

Also, 14 young untreated syphilitics were examined at that time and added to the study group. The total number of examinations recorded was 423. Of these individuals, 155 were untreated syphilitics, 115 were infected but had received some treatment, and 153 were believed to be nonsyphilitic.

Before the necessary tabulations of the findings from these examinations were completed, an analysis of the comparative mortality in the original syphilitic and control groups was made (2). The results of this analysis indicated that the death rate among the syphilitics was more than 75 percent greater than among the controls and the life expectancy approximately 20 percent less, these differences being greatest in the lower age groups.

It is the purpose of the present paper to discuss the over-all results of the second physical examination. While the conclusions corroborate those of the first examination, no direct comparison of the two sets of findings is possible either on a case-by-case basis or through analysis of the material as a whole. There are several facts which would tend to invalidate the comparison of the two examinations case by case, the most important of which is the manner in which the examinations were performed. In the first place, different clinicians carried out the two sets of examinations. This, of course, introduces several biases. The observations requiring a graded but not actually measured recording are not reported in the same manner by different individuals; and in addition, even where quantitative measurements are involved, the clinicians responsible for the respective examinations, because of their particular training and interests, made

their measurements in slightly different fashions.

Furthermore, the emphasis of the second examination was intentionally somewhat different from that of the first. Because of the significant cardiovascular findings in the first examination, the well-known high incidence of cardiovascular syphilis in the Negro race and the controversial questions involved in the diagnosis of early uncomplicated syphilitic aortitis, the second examination placed relatively far more emphasis on the examination of the circulatory system than was true of the first examination. More refined technics were used and a greater proportion of the examiner's time was given over to this aspect of the investigation, so that many observations were made for which there were no comparable data in the first examination.

A further consideration which weighed against basing this analysis on the comparison of the first examination of an individual with the second examination of the same individual is the fact that limiting the analysis to those cases for whom both examinations were performed would so reduce the number of cases available for study that few significant conclusions would be reached. By 1938 it was possible to examine only 409 of the original 600-odd patients, and some of these had to be excluded because of a change of status. For instance, when histories were taken at the time of the second examination, it was found that some of the syphilitics had received small amounts of antisyphilitic treatment. The histories were vague and the amounts of treatment involved may very well be negligible, but it was felt that such cases should be excluded from the present analysis in order to be as sure as possible that the syphilitic group represented only completely untreated cases.

Partly in an attempt to compensate for this reduction in number, the second study included some additional untreated syphilitics who had not been examined with the original study group. Also, a small number of patients who were in-

cluded in the original nonsyphilitic control group acquired syphilis during the period between the two examinations.

A part of the original plan of the study was to have almost identical age distributions in the syphilitic and control groups. This permitted direct comparison of the relative frequencies of any given condition found in members of the two groups, despite the fact that the findings in any physical examination are directly dependent upon the age of the examinee. Unfortunately, this carefully planned characteristic has been lost. Several factors are responsible.

One is the difference in life expectancy that exists between an untreated syphilitic population and a nonsyphilitic population. This has been discussed in the second paper of this series (2), where it was shown that the mortality rate for any given age is higher among untreated syphilitics than among nonsyphilitics under the same general conditions. In other words, a larger proportion of the controls than of the syphilitics survived into the older ages. On the other hand, the syphilitics that were excluded from the present analysis because of the possibility of their having received anti-syphilitic treatment were for the most part from among the younger age groups. Likewise, the new cases of syphilis that were included at the time of the second examination were in young individuals. These biases, being in opposite directions, might be expected to have a tendency to compensate one for the other. Nevertheless, upon investigation, it was found that significant differences do not exist in the two age distributions.

Since no direct comparison of the original material with the present series is possible, it was decided to employ a method of analysis somewhat different from that of the first report in presenting the findings of the second examination. This was done for the following reason. The differences observed between syphilitic and nonsyphilitic groups with respect to the percentage showing diagnosable disease will decrease with the passage of time. For in the physical ex-

amination of any group of people, the proportion in whom definite pathologic conditions can be recognized will naturally increase with advancing age. Thus, in the present instance, if comparisons were made only between the proportions of individuals with various demonstrable disease conditions among the syphilitic group and similar proportions among the control group, real differences which might exist with regard to the duration, severity, extent, or location of the involvement might be hidden. That is, if account is taken only of the proportional number of cases in each group without demonstrable pathologic conditions, and if most of the members in both groups have reached ages at which they can be expected to exhibit some such findings, then the differences will be small and statistical significance could be demonstrated only with very large groups.

With this in mind, it was decided to use the following method of analysis. As in the analysis of the results of the first examination, the question of etiology was not considered. However, instead of assigning and counting specific diagnoses, based in each case upon a consideration of all the findings noted by the examining physician, the individual observations and measurements were themselves tabulated. Descriptive terms are, of course, used where numerical measurements could not be made, but these do not represent specific disease entities. They merely represent observed physical signs possibly pointing toward diagnosable pathologic conditions.

The facts that the physical signs of disease increase in frequency with advancing age and that the relative age distributions of the two groups are no longer similar presented the chief difficulty in evaluation. All the data were analyzed by age. Findings expressed qualitatively were divided into 10- or 20-year-age groups, and comparisons between syphilitics and controls are made only within the respective age groups, not between all the syphilitics and all the controls. Where the findings could be ex-

pressed numerically, however, simple regression lines were determined by the method of least squares for each group with age as the independent variable. Tests of statistical significance based on the scatter of the individual observations around the computed lines were made to determine whether the two groups differed at a given age and whether the effect of advancing age was greater in one group than in the other. No measurement investigated revealed significant differences in the effect of age.

Paralleling the first paper in the series, the purpose of the present analysis is to determine whether or not there are indications that syphilis constitutes a predisposing factor to disease regardless of whether the observed pathologic condition can be directly attributed to syphilis. Since, for reasons already discussed, the cardiovascular system was examined in much more detail than the other systems of the body, the greater part of the material is concerned with the physical findings relating to this system.

Some of our tabulations suggest that the diagnosis of uncomplicated syphilitic aortitis may be placed on a sounder basis than has been possible up to the present time; that by means of a combination of various X-ray measurements and their careful correlation with the history and physical findings, a greater proportion of the cases in the early stages of cardiovascular syphilis may be detected. Final analysis and presentation are awaiting the completion of another examination tentatively planned sometime in the near future. The cardiovascular findings will be presented in detail at that time. The present report, therefore, will present only the broader aspects of the cardiovascular examination, limited for the most part to physical findings that can be expressed in numerical or quantitative terms. For example, the various X-ray measurements of the heart and aorta constitute a large proportion of the data.

Figure 1 shows the results of the Vaquez-Bordet aortic measurement (3), which is obtained by adding the distance

from a line drawn through the heart
parallel to the midsternal line to the out-
ermost point of the shadow of the de-
scending aorta on the left and the distance

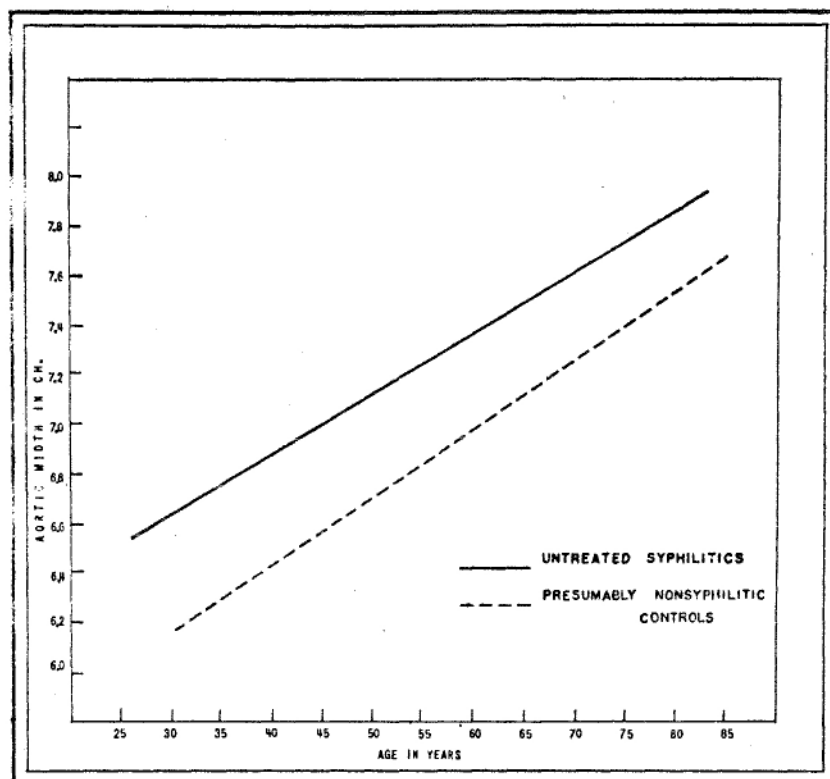


FIGURE 1.—Vaquez-Bordet measurements of the aorta in a group of untreated syphilitic adult Negro males and a comparable group of presumably nonsyphilitic controls; average at each age represented by a computed regression line.

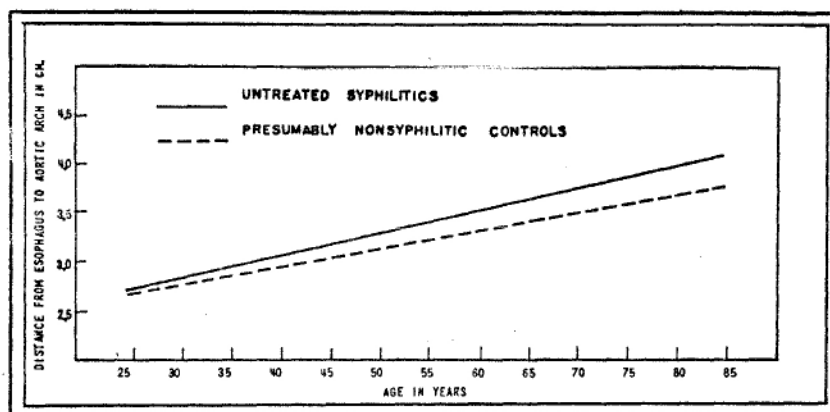


FIGURE 2.—Kreuzfuchs measurements of the aorta in a group of untreated syphilitic adult Negro males and a comparable group of presumably nonsyphilitic controls; average at each age represented by a computed regression line.

from the same line to the shadow of the ascending aorta or other great vessels on the right. The upper limit of normal is generally taken to be about 6 cm. Figure 2 represents the results of the measurement of transverse aortic diameter defined by Krenzfuhs (4), which is obtained by measuring the distance from the outermost bulge of the aortic shadow on the left horizontally to the right border of the shadow at the point where it impinges upon the barium-filled esophagus, 2 mm. being subtracted to allow for thickness of the esophageal wall. In the normal adult this measurement should not exceed 3 cm. Figure 3 is based on the measurement of the width of the aortic chord in relation to the width of the thoracic cage as described by Fray (5). To obtain this measurement, a film is made with the patient placed as accurately as possible before the cassette at a 45° angle in the left postero-anterior oblique position. On the film a line is drawn from the left costovertebral articulation to the right anterior chest wall at the level of the aortic chord. This is measured and its length divided by the distance across the aortic arch (i. e., the outside dimension of the arch). The resulting index in a normal group studied by Fray was usually 2.0 or more, whereas in a group having known pathologic con-

ditions it was almost invariably less than 2.

As can be seen from the figures, the aortic measurements were more abnormal at all ages among the syphilitics than among the presumably nonsyphilitic controls. The differences observed in the Kreuzfuhs measurement of aortic width (see fig. 2) are not statistically significant; however, at every age the syphilitics show more abnormality in some degree. The differences observed between the two groups in both the Vaquez-Bordet and the Fray measurements are highly significant.

Table 1 shows the evidence of dilatation of the ascending portion of the aorta found on fluoroscopic examination. Dilatation increases with age for both the syphilitics and for the controls, of course. However, it can readily be seen that the syphilitics constantly show more abnormality at all ages. None of the controls under 35 years of age showed any evidence of dilatation, whereas 9 percent of the syphilitics showed inconclusive evidence of abnormality, and 9 percent were definitely abnormal. Among individuals over 65 years of age, about one-fourth of the syphilitics showed inconclusive evidence of dilatation, as did about 40 percent of the controls. However, definite abnormality was observed in about 40 percent of the syphilitics in this age

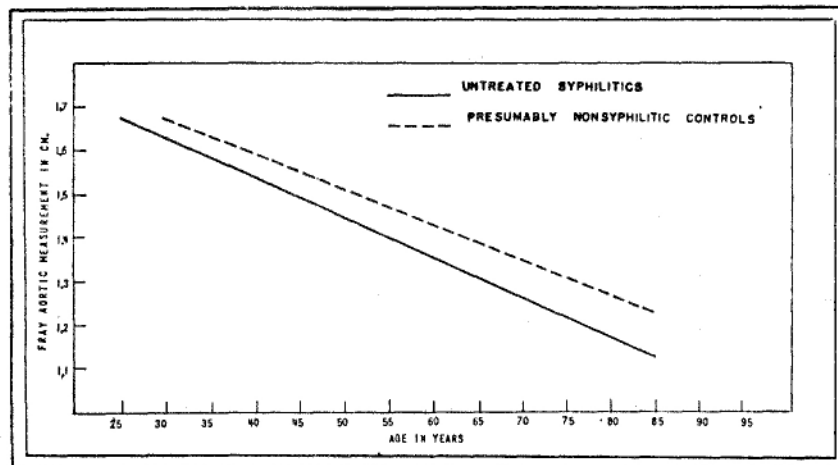


FIGURE 3.—Fray measurements of the aorta in a group of untreated syphilitic adult Negro males and a comparable group of presumably nonsyphilitic controls; average at each age represented by a computed regression line.

TABLE 1.—The number and percentage of individuals who presented evidence of dilatation of the ascending aorta on fluoroscopic examination among a group of untreated syphilitic adult Negro males and a comparable group of presumably nonsyphilitic controls, shown by age

Age at time of examination	Fluoroscopic examination of the ascending aorta							
	No evidence of dilatation		Evidence of dilatation				Total ¹	
			Inconclusive		Definite			
	Non-syphilitic controls	Un-treated syphilis	Non-syphilitic controls	Un-treated syphilis	Non-syphilitic controls	Un-treated syphilis	Non-syphilitic controls	Un-treated syphilis
	Number							
25-34.....	25	9	1	1	1	1	25	11
35-44.....	20	12	1	3	3	7	30	15
45-54.....	34	23	9	11	2	7	45	41
55-64.....	17	30	8	9	3	14	28	53
65-74.....	6	9	6	5	2	11	14	26
75 and over.....	3	1	2	3	3	3	5	7
	Percent							
25-34.....	100.0	81.8	0.0	9.1	0.0	9.1	100.0	100.0
35-44.....	96.7	80.0	3.3	20.0	0.0	0.0	100.0	100.0
45-54.....	75.6	56.1	20.0	26.8	4.4	17.1	100.0	100.0
55-64.....	60.7	56.6	28.6	17.0	10.7	26.4	100.0	100.0
65-74.....	42.9	38.0	42.9	20.0	14.3	44.0	100.0	100.0
75 and over.....	60.0	14.3	40.0	42.9	0.0	42.9	100.0	100.0

¹ This tabulation excludes 9 individuals on whom fluoroscopic examinations were not done.

group as compared with only about 10 percent of the controls. The differences observed in the percentage showing evidence of abnormality on fluoroscopic examination are statistically significant.

Since it is well known that the aorta is a relatively common site of late syphilitic involvement, the above results would more or less be expected. However, other evidences of cardiovascular damage not considered by most authorities to be specifically associated with syphilis also were observed more frequently among the untreated syphilitic group than among the nonsyphilitic individuals. Figures 4 and 5 show X-ray measurements related to the size of the heart. The ratio of the transverse diameter of the heart to the internal diameter of the thorax measured at its widest point just above the diaphragm is the basis of figure 4, and in figure 5 appears Fray's measurement of the relation of the transverse diameter of the heart to the thorax in the left postero-anterior position (5). For this

measurement, a film is taken with the patient in position as for the aortic chord measurement, and a horizontal line is drawn from the left costovertebral articulation to the right anterior chest wall through the widest part of the cardiac silhouette. A second line is then erected perpendicular at the midpoint of this horizontal line so as to strike a point on the right lateral wall of the trachea immediately above the bifurcation. The reported measurement is the ratio of the length of the first line to the sum of the maximal distance from the second line to the outermost borders of the heart shadow on the right and on the left. In Fray's experience a ratio less than 1.8 indicated enlargement, whereas one greater than 2.0 indicated abnormal decrease in heart size.

The differences observed in these figures are much smaller than those observed in the various aortic measurements. In fact, practically no difference was detected between the two groups in

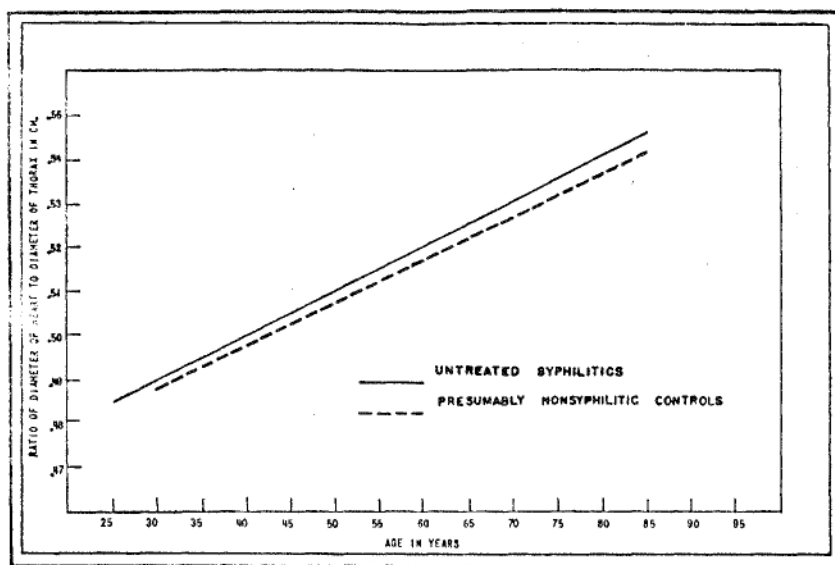


FIGURE 4.—The ratio of the transverse diameter of the heart to the internal diameter of the thorax in a group of untreated adult Negro males and a comparable group of presumably nonsyphilitic controls; average at each age represented by a computed regression line.

the Fray mensuration of heart size (see fig. 5). However, the measurements shown in figure 4 indicate the presence of more abnormality among the syphilitic group.

The systolic and diastolic blood pressures and their difference (the pulse pressure) were investigated, and the results are shown in figures 6, 7, and 8. Increased blood pressure, of course, re-

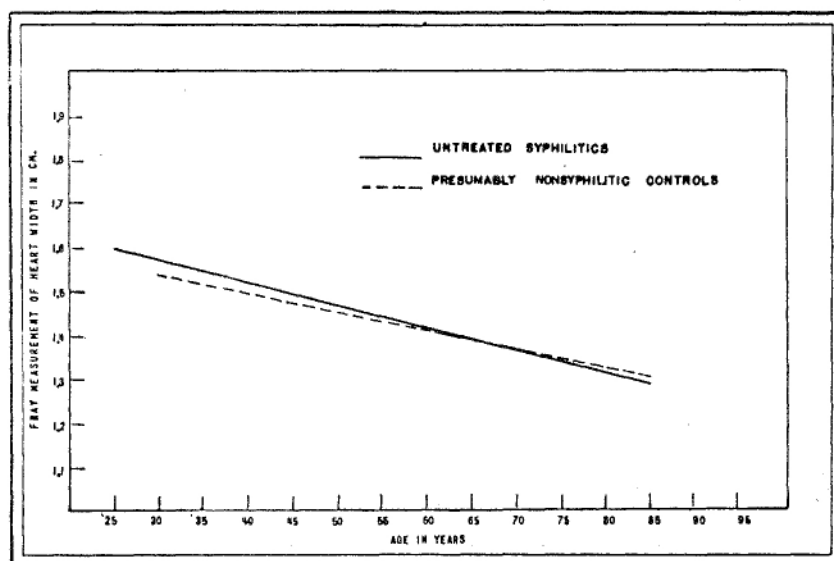


FIGURE 5.—Fray measurement of the heart width in a group of untreated syphilitic adult Negro males and a comparable group of presumably nonsyphilitic controls; average at each age represented by a computed regression line.

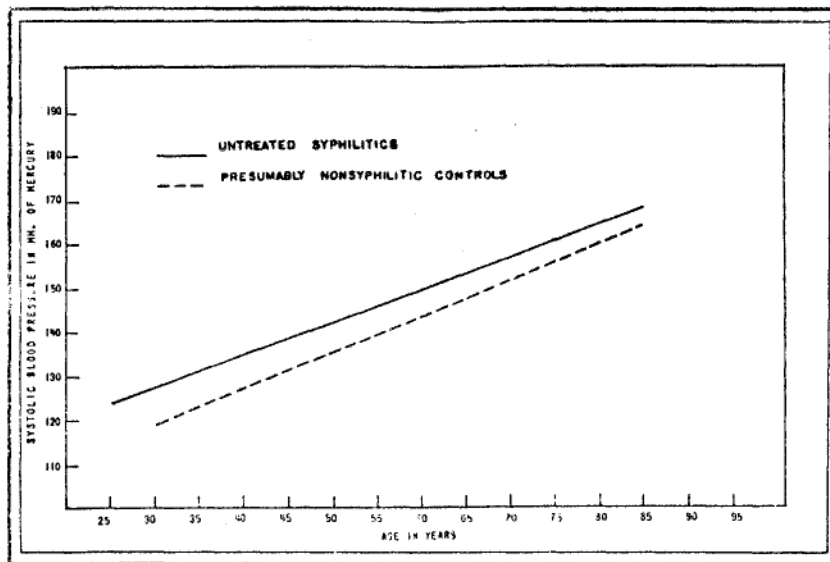


FIGURE 6.—The measurement of systolic blood pressure in a group of untreated adult Negro males and a comparable group of presumably nonsyphilitic controls; average at each age represented by a computed regression line.

sults from a variety of causes, and syphilis is not commonly believed to be a significant etiologic factor. In fact, a diagnosis of uncomplicated syphilitic aortitis is usually considered to be unreliable in the presence of a coexisting

hypertension. It is the more interesting, then, that both the systolic and diastolic blood pressures were higher among syphilitics than among nonsyphilitics, and that the pulse pressure among the syphilitic group was also greater.

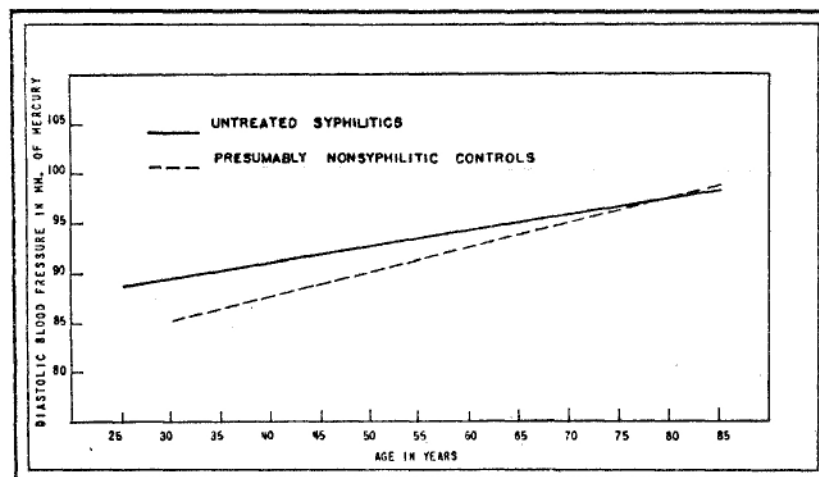


FIGURE 7.—The measurement of diastolic blood pressure in a group of untreated syphilitic adult Negro males and a comparable group of presumably nonsyphilitic controls; average at each age represented by a computed regression line.

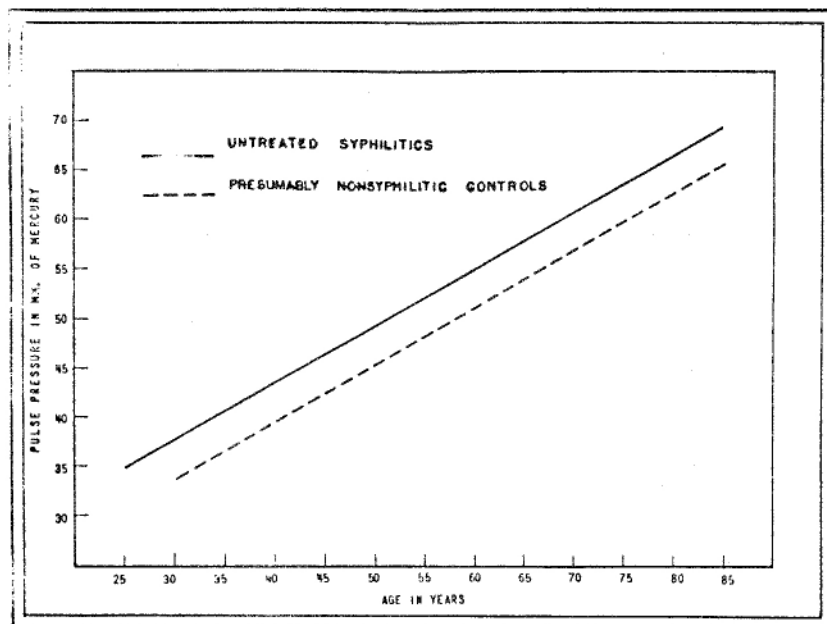


FIGURE 8.—The measurement of pulse pressure in a group of untreated syphilitic adult Negro males and a comparable group of presumably nonsyphilitic controls; average at each age represented by a computed regression line.

The radial, brachial, temporal, and retinal vessels were examined for evidences of the presence of arteriosclerosis. The results are tabulated in table 2. The retinal vessels apparently do not become involved until late in life, and no differences were noted between the two groups. In no instance, either among the syphilitics or among the controls, was evidence of arteriosclerosis observed in the retinal vessels among persons under 45 years of age, and there was no difference found in the proportion of such cases from one group to the other in older individuals. However, examination of the radial, brachial, and temporal vessels did reveal evidence of arteriosclerosis more frequently in the syphilitic than in the control group. Statistical tests showed that, in the younger ages, the percentage of the syphilitics in which evidence of arteriosclerosis could be detected is significantly greater than the corresponding percentage of the controls.

The other systems of the body were not examined in as much detail as was

the cardiovascular system, nor were laboratory diagnostic aids employed to any great extent. A thorough physical examination was made, however, and the abnormalities observed were noted on the case records. In analyzing the results, a single tabulation was prepared for each system of the body, comparing the proportion of individuals with any abnormality involving that system in the two groups and giving details concerning the individual abnormalities where the data permitted.

It was found that no system of the body showed significantly more evidence of morbidity among individuals of the control group than was found among the individuals infected with syphilis. Further, no system having differences too small to be significant exhibited a consistent pattern of differences pointing toward more abnormality among the uninfected group. Thus the tabulation of data relating to the skin, skeletal, auditory, and upper respiratory systems revealed no difference in morbidity between the two groups. Such differences as were

TABLE 2.—The number and percentage of individuals revealing signs of arteriosclerosis in an examination of the radial, brachial, temporal, and retinal vessels among a group of untreated syphilitic adult Negro males and a comparable group of presumably nonsyphilitic controls, shown by age

Age in years	No definite signs of arteriosclerosis				Evidence of arteriosclerosis				Total *			
	Syphilitics		Controls		Syphilitics		Controls		Syphilitics		Controls	
	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent
Radial vessels												
25-34.....	11	100.0	26	100.0	-----	0.0	-----	0.0	11	100.0	26	100.0
35-44.....	13	86.7	27	84.4	2	13.3	5	15.6	15	100.0	32	100.0
45-54.....	14	34.1	21	48.7	27	65.9	24	53.3	41	100.0	45	100.0
55-64.....	5	9.8	4	13.3	46	90.2	26	86.7	51	100.0	30	100.0
65 and over.....	-----	0.0	1	5.6	32	100.0	17	94.4	32	100.0	18	100.0
Brachial vessels												
25-34.....	11	100.0	26	100.0	-----	0.0	-----	0.0	11	100.0	26	100.0
35-44.....	12	80.0	27	84.4	3	20.0	5	15.6	15	100.0	32	100.0
45-54.....	13	31.7	22	48.9	28	68.8	23	51.1	41	100.0	45	100.0
55-64.....	5	9.6	4	13.3	47	90.4	26	86.7	52	100.0	30	100.0
65 and over.....	-----	0.0	1	5.9	32	100.0	16	94.1	22	100.0	17	100.0
Temporal vessels												
25-34.....	11	100.0	26	100.0	-----	0.0	-----	0.0	11	100.0	26	100.0
35-44.....	13	86.7	29	90.6	2	13.3	3	9.4	15	100.0	32	100.0
45-54.....	23	56.1	33	73.3	18	43.9	12	26.7	41	100.0	45	100.0
55-64.....	16	30.8	16	51.6	36	69.2	15	48.4	52	100.0	31	100.0
65 and over.....	9	29.0	3	16.7	22	71.0	15	83.3	31	100.0	18	100.0
Retinal vessels												
25-34.....	11	100.0	26	100.0	-----	0.0	-----	0.0	11	100.0	26	100.0
35-44.....	15	100.0	32	100.0	-----	0.0	-----	0.0	15	100.0	32	100.0
45-54.....	32	78.0	36	81.8	9	22.0	8	18.2	41	100.0	44	100.0
55-64.....	18	34.6	12	40.0	34	65.4	18	60.0	52	100.0	30	100.0
65 and over.....	2	8.0	-----	0.0	23	92.0	17	100.0	25	100.0	17	100.0

* The above tabulations exclude varying numbers of individuals for whom parts of the physical examination were not recorded. The following numbers were omitted for the individual sections: Radial vessels, 7; brachial vessels, 7; temporal vessels, 6; retinal vessels, 15.

observed, all of them small enough to be consistent with the hypothesis that they arise through chance alone, were not all in the same direction.

On the other hand, the examination did reveal differences for some systems of the body, which, while not large enough to be significant, were consistently all in the direction indicating more morbidity among the syphilitic study group. Moreover, some systems showed unquestionable differences in this direction. Table 3 presents the results of the physical examination of the lymph nodes, the eyes, the pulmonary system, the genitourinary system, and the neurologic apparatus.

Section A of table 3 is a summary of the abnormal findings observed in examining the lymph nodes. A significantly greater percentage of the syphilitic cases than of the controls gave evidence of abnormal conditions of the lymph nodes. In every age group the percentage of cases showing pathologic changes in the lymph nodes is greater among the syphilitics. Furthermore, the difference is greatest in the youngest age group. The inguinal, epitrochlear, and cervical regions are the only three sites in which lymph node abnormalities were noted in either group with sufficient frequency to permit analysis. All these exhibited

TABLE 3.—Number and percentage by age of individuals showing physical defects and/or evidence of disease involving the lymph nodes, the eyes, the pulmonary system, the genitourinary system, and the nervous system among a group of untreated syphilitic adult Negro males, and a comparable group of presumably nonsyphilitic controls

A. Proportion showing involvement of the lymph nodes

Age in years	Total number examined ¹	Total cases with lymph node involvement		Site of involvement							
				Inguinal region		Epitrochlear region		Cervical region		Other regions	
		Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent
Syphilitics											
25-34.....	11	4	36.4	4	36.4	3	27.3	2	18.2	-----	0.0
35-44.....	15	3	20.0	3	20.0	1	6.7	1	6.7	-----	0.0
45-54.....	42	9	21.4	4	9.5	6	14.3	-----	0.0	-----	0.0
55-64.....	54	8	14.8	8	14.8	6	11.1	3	5.6	-----	1.9
65 and over.....	32	6	18.8	4	12.5	2	6.3	3	9.4	2	6.3
Controls											
25-34.....	26	3	11.5	2	7.7	2	7.7	-----	0.0	1	3.8
35-44.....	32	6	18.8	4	12.5	2	6.3	-----	0.0	-----	0.0
45-54.....	45	5	11.1	4	8.9	3	6.7	-----	0.0	1	2.2
55-64.....	31	4	12.9	4	12.9	3	9.7	1	3.2	1	3.2
65 and over.....	19	2	10.5	2	10.5	1	5.3	1	5.3	1	5.3

B. Proportion showing involvement of the eyes

Age in years	Total number examined ¹	Cases having eye defects		Total eye defects found		Eye defects observed												
						Lesions of the cornea		Lesions of the lens		Lesions of the retina		Lesions of the choroid		Cataracts		All other defects ²		
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent			
Syphilitics																		
25-44.....	26	3	11.5	3	11.5	---	0.0	---	0.0	1	3.8	---	0.0	---	1	3.8		
45-64.....	96	23	24.0	41	42.7	3	3.1	7	7.3	10	10.4	15	15.6	1	1.0	5	5.2	
65 and over.....	32	18	56.3	26	81.3	4	12.5	9	28.1	5	15.6	4	12.5	---	---	---	0.0	
Controls																		
25-44.....	58	4	6.9	4	6.9	---	0.0	---	0.0	---	0.0	---	0.0	---	1	1.7	3	5.2
45-64.....	76	19	25.0	24	31.6	2	2.6	1	1.3	4	5.3	9	11.8	2	2.6	6	7.9	
65 and over.....	19	13	68.4	14	73.7	---	0.0	---	6	31.6	1	5.3	3	15.8	4	21.1	---	0.0

C. Proportion showing involvement of the pulmonary system

Ages in years	Total number examined ¹	Cases showing evidence of pathologic conditions of pulmonary system	
		Number	Percent
Syphilitics			
25-34.....	11	1	9.1
35-44.....	15	1	6.7
45-54.....	42	4	9.5
55-64.....	54	22	40.7
65 and over.....	32	25	78.1
Controls			
25-34.....	26	1	3.8
35-44.....	32	—	0.0
45-54.....	45	2	4.4
55-64.....	31	14	45.2
65 and over.....	19	14	73.7

D. Proportion showing involvement of the genitourinary system

nary system			
Age in years	Total number examined ¹	Cases showing evidence of pathologic conditions of genitourinary system	
		Number	Per cent
Syphilitics			
25-34...	11	1	9.1
35-44...	15	6	40.0
45-54...	41	8	19.5
55-64...	55	15	27.3
65 and over.	32	10	31.3
Controls			
25-34...	26	1	3.8
35-44...	32	5	15.6
45-54...	45	8	17.8
55-64...	31	6	19.4
65 and over.	19	4	21.1

E. Proportion showing involvement of the nervous system

system			
Age in years	Total number examined ¹	Cases showing evidence of pathologic conditions of nervous system	
		Number	Percent
Syphilitics			
25-44...	26	1	3.8
45-64...	96	13	13.5
65 and over.	32	7	21.9
Controls			
25-44...	58	1	1.7
45-64...	76	8	10.5
65 and over.	19	4	21.1

¹ Each of the above tabulations excludes 1 individual on whom these parts of the physical examination were not done.

² Includes eye defects which were observed in fewer than 5 cases in both groups.

more frequent abnormal conditions among members of the syphilitic group.

The results of examination for pathologic conditions involving the eye (other than the optic nerve) are presented in section B of table 3. Both the number of individuals showing eye involvement and the total number of eye conditions observed are shown, the latter being subdivided into several categories. With regard to the proportion of individuals showing eye defects there was no significant difference between the syphilitic and control groups, the percentage found in the syphilitics being slightly higher in the youngest age group and slightly lower in the other two. However, it was observed that the differences in the total number of defects in relation to the number of individuals examined in the two groups were much more marked, considerably fewer defects being noted among the nonsyphilitics. Likewise, it was found that the nonsyphilitics exhibited a smaller proportion of affected individuals in each of the specific categories listed except that of "cataract," where it appeared that cataracts were

slightly more frequent among nonsyphilitics.

The visual acuity among the two groups is shown in figure 9. It was found that the relationship of visual acuity to age could not be properly represented by a straight line, so the data were fitted to a parabola instead. No significant differences were found to exist between the right and left eye in either group. The recordings for the two eyes were combined, therefore. As can be seen from the figure, the syphilitics exhibited more loss of vision at all ages than did the controls. While the difference between the curves representing their average visual acuity at each age is not statistically significant, nevertheless, it probably represents a real rather than a chance difference, since it is corroborated by the fact that qualitative eye defects were also observed more commonly among the syphilitic group (see table 3, sec. B).

Section C of table 3 deals with evidence of pulmonary disease. The differences observed are small and are by no means significant. The three younger age groups all show a higher percentage of cases

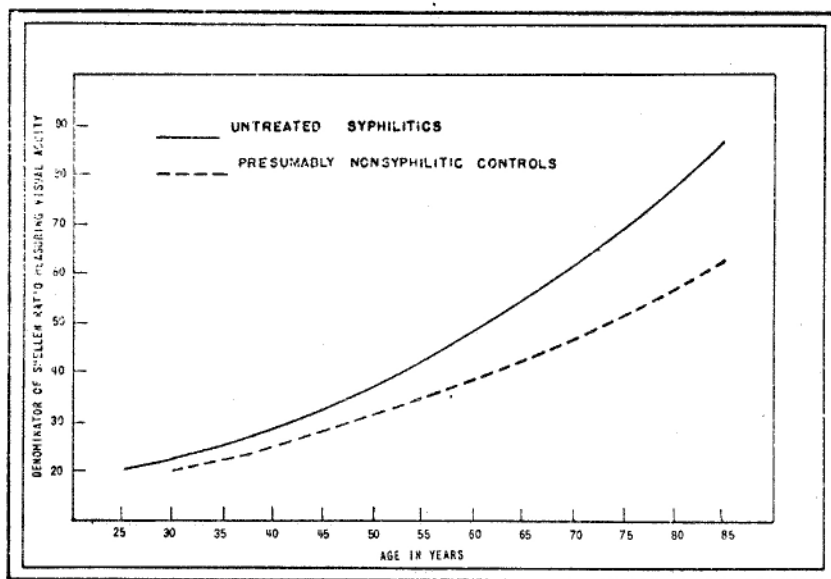


FIGURE 9.—The measurement of visual acuity in a group of untreated syphilitic adult Negro males and a comparable group of presumably nonsyphilitic controls; average at each age represented by a parabola.

with abnormality among the syphilitics. The older ages show little difference from one group to another. Individuals aged 55 to 64 years show slightly more abnormality among the controls, while the older groups, over 64 years of age, show slightly more abnormality among the syphilitics. That the indications pointing toward the presence of more disease among the syphilitics in the younger ages probably represent an actual tendency is evidenced by the fact that six of the syphilitic patients showed definite evidence of pathologic lung conditions as compared with only three of the control group.

The percentage of cases showing evidence of abnormality involving the genitourinary system is given for the two groups in section D of table 3. Here again, significant differences could not be demonstrated. However, in every age group, the small differences observed were in the direction of a higher percentage of the syphilitic group with evidence of possible genitourinary disease than was true of the group that did not have syphilis.

Much of the same pattern can be seen in section E of table 3 which shows the cases presenting some evidence of disease of the nervous system. In the three large age groupings listed, 3.8 percent, 13.5 percent, and 21.9 percent, respectively, of the syphilitics showed possible or definite nervous system abnormality. The corresponding percentages among the controls were 1.7, 10.5, and 21.1.

DISCUSSION

The above findings viewed as a whole lead to the conclusion that an untreated syphilitic population exhibits appreciably more morbidity than an uninfected population of similar characteristics and environment.

That syphilis is a serious disease and, in the absence of treatment, may become a source of much suffering and disability is well known. But specific definition and quantitative evaluation of these effects are incomplete because an opportunity to study the natural course of the disease in individuals not subjected to specific therapy occurs so infrequently. Two recent reports have considerably increased the available information on these points. Rosahn (7) has adduced evidence, based on a series of hospital autopsies, that even when death from paresis is excluded, approximately 2 out of 10 individuals with untreated syphilis die as a direct result of their infection. Heller (2) found that among the subjects forming the basis of the present study, the over-all mortality from all causes during a 12-year period of observation was more than 75 percent greater in the untreated syphilitics than in the uninfected controls.

The present discussion indicates that the living syphilitic not specifically treated for his infection is subject to a considerably greater amount of physical disability, not necessarily fatal, than an uninfected person living under similar conditions. Such impairment of bodily functions may be directly caused by the syphilis, or may be the result of greater susceptibility to other morbid conditions. Considering these results in conjunction with the findings of Rosahn and Heller, it is clear that in the absence of treatment the person infected with syphilis, even though he may escape the late crippling manifestations which lead directly to death, still runs a considerable risk of having his life span shortened by other fatal conditions. In addition, he can expect to experience more manifestations of ill health of all kinds than do uninfected persons.

REFERENCES

1. VONDERLEHR, R. A.; CLARK, T.; WENGER, O. C.; HELLER, J. R., JR.: Untreated syphilis in the male Negro. A comparative study of treated and untreated cases. *Ven. Dis. Inform.*, 17: 260-265, 1936.
2. HELLER, J. R., JR.; BRUYERE, P. T.: Untreated syphilis in the male Negro. II. Mortality during 12 years of observation. *J. Ven. Dis. Inform.*, 27: 34-38, 1946.
3. VAQUEZ, H.; BORDET, E.: The heart and the aorta; studies in clinical radiology. Tr. from the 2d French ed. by J. A. Honey and J. Macy, with 181 illustrations. New Haven, Yale Univ. Press. 1920.
4. KREUZFUCHS, S.: Über eine neue Methode der Aortenmessung. (A new method for aorta measurement.) *Med. Klin.*, 16: 36-39, 1920.
5. FRAY, W. W.: Mensuration of heart and chest in left posteroanterior oblique position; comparative study; correlative measurements of the aortic arch and thorax. *Am. J. Roentgenol.*, 27: 585-602, 1932.
6. FRAY, W. W.: Mensuration of heart and chest in left posteroanterior oblique position; comparative study; relation of the transverse diameter of the heart to thorax. *Am. J. Roentgenol.*, 27: 177-186, 1932.
7. ROSAHN, P. D.: Studies in syphilis. VII. The end results of untreated syphilis. *J. Ven. Dis. Inform.*, 27: 293-301, 1946.

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